1,100,114

PATENT SPECIFICATION

DRAWINGS ATTACHED

1,100,114

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COMPLETE SPECIFICATION

Improvements in or relating to Tube Fittings and their attachment to Tubes

We, AVICA EQUIPMENT LIMITED, a British Company of Mark Road, Hemel Hempstead, Hertfordshire, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to the attachment of fittings to the ends of tubes. It is especially concerned with tubes of the type comprising a fluid tight inner metal flexible tube or conduit and an outer tubular sheath of metal woven braid provided to carry end load and to protect the inner tube. Such tubes will hereafter be referred to as tubes of the type described.

The method of attaching a two-part fitting to a tube of the type described in accordance with the invention comprises inserting an end portion of one part into the flexible tube welding the end of the inner flexible tube to the said one part of the fitting and the end of the outer braid sheath, to another part of the fitting which is in the form of a collar surrounding the sheath, by a separate weld. This procedure enables the inner tube to be secured by a "seal" weld which is not adapted to transmit loads but which enables the connection between the inner fluid tight flexible tube and the fitting to be made in a fluid tight manner. As this weld does not have to transmit load it can be of relatively small area and hence requires less heat during its formation thus minimising possible heat damage to the inner tube. The weld between the sheath and the fitting is designed to transmit end loads and hence is a "structural" or "load" weld. The position of this weld can be arranged to be located apart from the inner tube so that the heat generated during welding of the braid sheath will not effect the inner tube.

The combination of a tube of the type described and a fitting in accordance with the invention comprises of two-part fitting one of which has an end portion inserted into the inner flexible tube or conduit of the tube of the type described and the other of which surrounds the outer braid sheath, the inner part which is preferably in the form of a tubular spigot or nipple having an upstanding annular shoulder arranged so that the end of the braid sheath is tightly held between the outer surface of the shoulder and the inner surface of the outer part of the fitting with the outer part is assembled in its final position. Due to the resulting compression of the strands of the braid, the strands are forced close together so that an effective welded joint can be made.

The "seal" weld between the inner flexible tube and the spigot can be located on the outer surface of the tubular spigot and the "load" weld between the braid sheath and the fitting can be located at the outer end of the braid which is held between the shoulder on the inner fitting part and the collar or the like surrounding the tube. The weld thus secures the braid both to the outer surface of the collar and the outer edge of the shoulder and this also secured the two parts of the fitting together.

An embodiment of a fitting in accordance with the invention will now be described by way of example, with reference to the accompanying drawing which is a part cross section through the fitting and tube.

The tube to which the fitting is to be applied comprises an inner flexible metal tube generally shown at 2 comprising a number

[Price 4s. 6d.]

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of helically arranged convolutions. This inner tube is surrounded by a sheath of woven metal braid generally indicated at 4. The inner tube 2 is fluid tight and arranged to transmit fluids but not to take up end loads these loads being transmitted by the braid sheath 4.

The fitting to be applied to the end of the tube comprises an inner tubular spigot or nipple 6 having an upstanding annular shoulder 8, and a collar or ferrule 10, the body of which is designed to fit over the braid sheath 4 and the end of which is adapted to be a fairly tight fit over the shoulder of the spigot. The inner part 6 of the fitting can have its outer end adapted for connection to some other part of a fitting or can itself form the desired end of the fitting.

The fitting is attached to the tube in the following manner. The inner tube 2 is cut at the crest of one of the helical convolutions and the free end of the convolution is sealed by welding. The inner end of the nipple or inner part of the fitting 6 is then screwed into the end of the tube and the end of the tube is welded to the outside of the nipple as generally indicated at 12 with a "seal" weld using filler rod. This joint should then be tested to ensure that a fluid tight connection has been made between the inner tube and the nipple of the fitting.

The braid sheath is then slipped over the inner tube 2 if not already present and the outer part or ferrule 10 of the fitting is disposed over the tube outside the braid sheath. The braid is arranged so that its end overlaps the end of the inner tube 2 by for example $\frac{1}{4}$" and extends over the upstanding shoulder 8 of the inner fitting part. The ferrule or collar 10 is then pushed hard over the shoulder 8 so that the braid is tightly trapped between the end of the collar or ferrule 10 and the outer surface of the shoulder 8. In order to facilitate efficient trapping of the braid, the outer end of the ferrule 10 can be tapered slightly as shown at 14 to correspond with a slight taper 16 on the outer surface of the shoulder 8. Due to the tight trapping of the braid its strands are brought closer together to assist welding. The body of the ferrule or collar is then swaged so that the braid is held tightly against the inner tube throughout the length of the collar.

The end of the braid sheath is then welded as indicated at 18 to the outer surface of the collar 10 and to the outer surface of the shoulder 8 without using a filler rod to provide a "load" weld so that end loads or the like applied to the tube are transmitted by the braid 4 to the inner part 6 of the fitting and not by the flexible inner tube 2. The weld 18 also secures the two parts 2, 6 of the fitting together.

It will be realised that the tube is connected to the fitting by means of two separate welds 12 and 18 each of which has a smaller area and hence can be of sounder construction, than would be the case if only a single weld were used to secure the tube to the fitting. Also the "seal" weld 12 does not have to transmit load which would tend to affect its efficiency.

WHAT WE CLAIM IS:—

1. The combination of a tube of the type having a fluid-tight inner metal flexible tube or conduit and an outer tubular sheath of metal woven braid and an end fitting comprising two parts one of which has an end portion inserted into the inner metal flexible tube or conduit and the other of which is in the form of a collar or sleeve surrounding the braid sheath, the inner part having an upstanding annular shoulder designed, in combination with the outer part, to provide a space within which the end portion of the braid sheath is tightly held, the inner flexible tube being welded to one part of the fitting and the end of the braid sheath being welded to another part of the fitting by a separate weld.

2. A combination as claimed in claim 1 in which the outer face of the annular shoulder of the inner part and the inner face of the outer end of the outer part, are correspondingly tapered.

3. A method of attaching a two part fitting to the end of a tube of the type comprising a fluid-tight inner metal flexible tube or conduit and an outer tubular sheath of metal woven braid, comprising inserting an end portion of one part into the flexible tube, welding the end of the inner flexible tube to the said one part of the fitting and the end of the outer braid sheath to another part of the fitting, which is in the form of a collar surrounding the sheath, by a separate weld, the weld between the sheath and the fitting being designed to transmit end loads and the weld between the inner flexible tube and the fitting being a "seal" weld, the said one part having an upstanding annular shoulder, the sheath being held between the shoulder and the collar.

4. A method as claimed in claim 3 in which the outer sheath of woven braid or the like is trapped before it is welded between an inner part of the fitting which engages in the end of the fluid tight tube and an outer sleeve or collar which engages over the sheath.

5. A method as claimed in claim 4 in which the collar or sleeve is swaged onto the sheath to cause the braid tightly to be held against the inner tube throughout the length of the collar or sleeve.

6. A tube fitting substantially as hereinbefore described with reference to the accompanying drawing.

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7. A method of attaching a fitting to a tube substantially as hereinbefore described.

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1 SHEET

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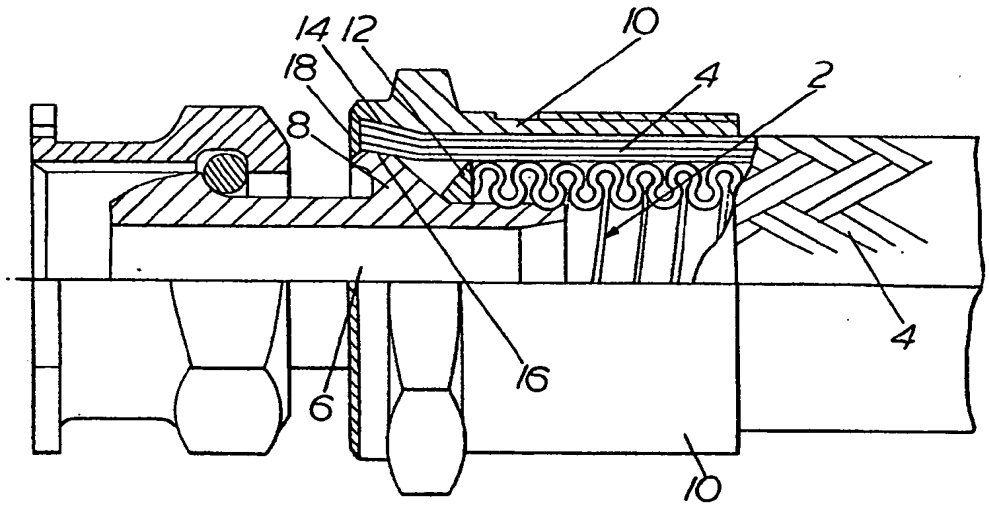
This drawing is a reproduction of the Original on a reduced scale.



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